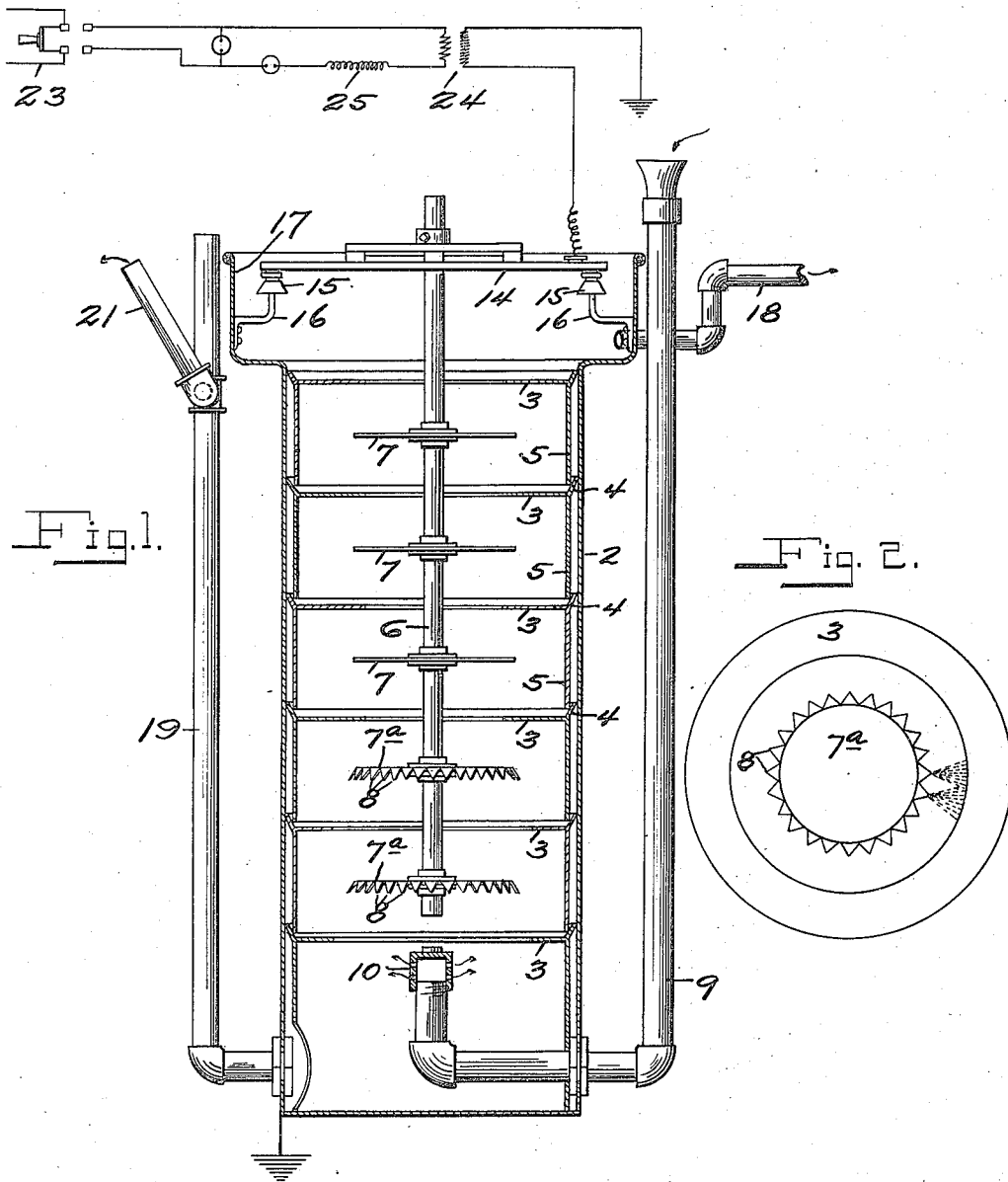


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 APPARATUS FOR DEHYDRATING OIL.
 APPLICATION FILED MAY 12, 1919.

1,414,079.

Patented Apr. 25, 1922.



WITNESS
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UNITED STATES PATENT OFFICE.

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APPARATUS FOR DEHYDRATING OIL.

1,414,079.

Specification of Letters Patent. Patented Apr. 25, 1922.

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To all whom it may concern:

Be it known that I, SAMUEL A. GIEBNER, a citizen of the United States, and a resident of Bakersfield, Kern County, State of California, have invented a certain new and useful Apparatus for Dehydrating Oil, of which the following is a specification.

The invention relates to an apparatus for separating water from emulsified oils, particularly those which come from oil wells.

An object of the invention is to provide an apparatus for separating water from emulsified oils, and particularly from emulsions in which the water occurs in a very finely divided state. Emulsions of oil and water occur in many different conditions, varying from those in which the water occurs in large drops to those in which the water particles are very minute. Apparatus has been devised heretofore for successfully treating the emulsions in which the water occurs in large drops, but these prior apparatus have been inefficient in treating emulsions in which the water occurs in very small particles. These latter emulsions are known to the art as "hard" emulsions and the object of this invention is to provide an apparatus which will successfully treat all emulsions, including the so-called "hard" emulsions.

The invention possesses other advantageous features, some of which, with the foregoing, will be set forth at length in the following description where I shall outline in full, that form of the apparatus which I have selected for illustration in the drawings accompanying and forming part of the present specification. In the drawings I have shown one specific form of the apparatus of my invention, but it is to be understood that I do not limit myself to such form, since the invention, as expressed in the claim, may be embodied in a plurality of forms.

Referring to said drawings:

Figure 1 is a vertical section of a treater embodying my invention.

Figure 2 is a plan of one of the electrodes employed in the treater, showing diagrammatically its relation to the other electrode and the non-uniform electrostatic field.

The apparatus comprises a metallic tank 2, closed at the bottom and open at the top. Arranged in the tank in superposed relation, are a plurality of annular electrodes 3, the

electrodes being preferably formed so that they may be readily placed in or quickly removed from the tank. For this purpose, each annular disc is provided with a shoulder 4 which contacts with the side of the tank, and depending from each disc is an apron 5 which rests upon the disc or the shoulder next below, or upon the tank bottom, thereby supporting the electrodes in position. The electrode units, comprising the disc, shoulder and apron, are preferably of the same height, with the exception of the lower one, so that the electrodes are spaced apart evenly in the tank.

Depending centrally into the tank is a support 6, upon which are mounted a plurality of circular disc electrodes 7, these electrodes being of opposite sign to the annular electrodes. The disc electrodes 7 may be all of the same diameter, or may be of different diameters. In the apparatus shown in the drawings, the apertures in the two lower annular electrodes 3 are larger in diameter than the apertures in the other annular electrodes, and the diameter of the two lower discs 7^a is greater than the diameter of the other discs. The relative diameters of the adjacent electrodes are such that the distance from the edge of the annular electrode to the edge of the disc electrode is substantially equal throughout the series.

One of the electrodes of each lower pair, in the present instance the disc electrodes 7^a, is provided with serrated or toothed edges, the teeth or projections 8 being preferably bent to point toward the inner edge of the annular electrode next below. The distance from the ends or points of the teeth to the inner edge of the annular electrode next below is substantially equal to the distance between the edges of the upper pairs of electrodes. When desirable, the serrated discs may be used throughout the treater, but since practically all of the separating action occurs between the lower sets of electrodes after the treater is in operation, I have shown the serrated electrodes at the lower portion of the treater only. The teeth or projections may be formed on the inner edge of the annular electrode or on the outer edge of the disc electrode, and I prefer to form them on the disc electrode. While I have shown two toothed electrodes, it is to be understood that I do not limit myself to that number, since

one or all of the discs may be provided with teeth.

The emulsion of oil and water is introduced into the tank 2 at the bottom, through the pipe 9 which discharges through a head 10, arranged centrally within the tank, below the lower annular electrode 3, the head being provided with apertures to distribute the emulsion and to minimize agitation. The emulsion passes upwardly in the tank in a tortuous path, between the electrodes 3 and 7^a and electrodes 3 and 7, where it is subjected to the action of the electrostatic field produced by the electric current. The action of the electrostatic field is to line up the fine water particles, forming complete chains of water particles, which coalesce, forming drops which pass downwardly through the treater, or which unite with other drops to form larger masses of water which move downwardly through the emulsion. The effect of the toothed electrodes is probably to produce a non-uniform electrostatic field in the zone between the electrodes 7^a and the electrodes 3. The electrostatic field is concentrated at the points 8 and spreads out toward the edge of the opposing electrode, producing a field of decreasing concentration from the toothed electrode to the edged electrode. The emulsion is flowed slowly up through the treater, encouraging the formation of complete chains of water particles or globules bridging the electrodes. When a complete chain of water particles bridging the electrodes is formed, the resistance of the path is reduced sufficiently to permit a large short-circuiting current to flow, with the immediate evolution of sufficient heat to vaporize a portion of the water and disrupt the short circuit.

The support 6 is supported on a frame 14, preferably arranged within the tank and supported on insulators 15, which are fixed on brackets 16 secured to the tank. In order to permit the insertion or withdrawal of the annular electrode units from the tank, the upper portion 17 thereof is of increased di-

ameter, so that the distance between the insulators is greater than the diameter of the annular electrode units. The oil from which the water has been separated flows from the tank through the pipe 18, which is preferably arranged at such a point that the insulators are immersed in the oil in the tank, the oil being a very efficient insulator. The water which has been separated from the emulsion discharges through the pipe 19 which extends upward to such height that the column of water therein balances the column of emulsion in the tank. The pipe 21, through which the water discharges, is turned up or down to adjust the height of the column of water in pipe 19 to maintain the level in the tank at the desired point.

Alternating current from the power mains 23 is passed through the primary of a step-up transformer 24 to raise it to the necessary potential and an inductive reactance 25 is placed in series, with said primary, for the purpose of limiting the amount of current which may be drawn from the power mains. One side of the secondary of the transformer is connected to the circular electrodes and the other side is grounded, and the tank is also grounded.

I claim:

In an apparatus for separating water from an emulsion of oil and water, a tank; an annular electrode arranged in said tank, a disc electrode concentric with said annular electrode and spaced vertically therefrom, one of said electrodes being provided on its operating edge with a plurality of projections, means for establishing a difference of potential between said electrodes whereby a series of electrostatic fields of varying concentration is established between said projections and the edge of the other electrode, and means for flowing an emulsion upwardly into said field.

In testimony whereof, I have hereunto set my hand at McKittrick, California, this 26th day of April, 1919.

SAMUEL A. GIEBNER.